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INT CL[5] H04M 1/72 11/00, H04N 7/18, H04Q 7/04
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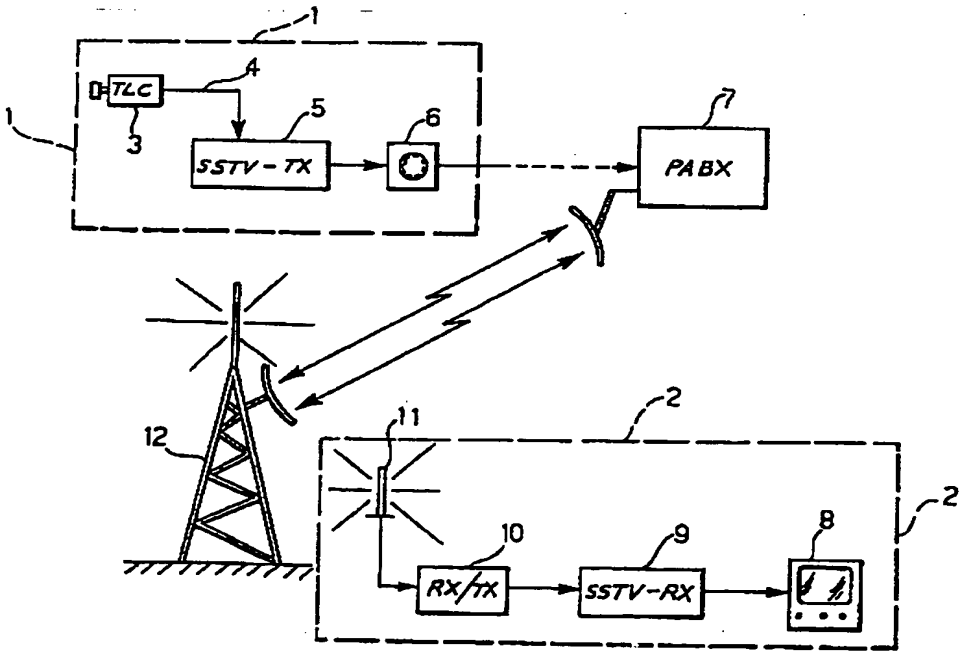
(54) Slow-scanning remote surveillance system using mobile cellular radio communications

(57) A first, fixed station 1 comprises a video camera 3 and slow-scanning transmitter 5 and passes slow-scan video signals through the telephone network 7 and the base station 12 of a cellular radio communications system to a second, mobile station 2 comprising a slow-scan receiver 9 and display 8 for monitoring events taking place at the remote station 1. Alternatively the camera may in a mobile station and the display in the fixed station, or both may be mobile. An alarm device may be provided to automate the calling of station 2 and alert a user at the station. Each station may have both a video camera and display to allow communication in both directions.

FIG. 1



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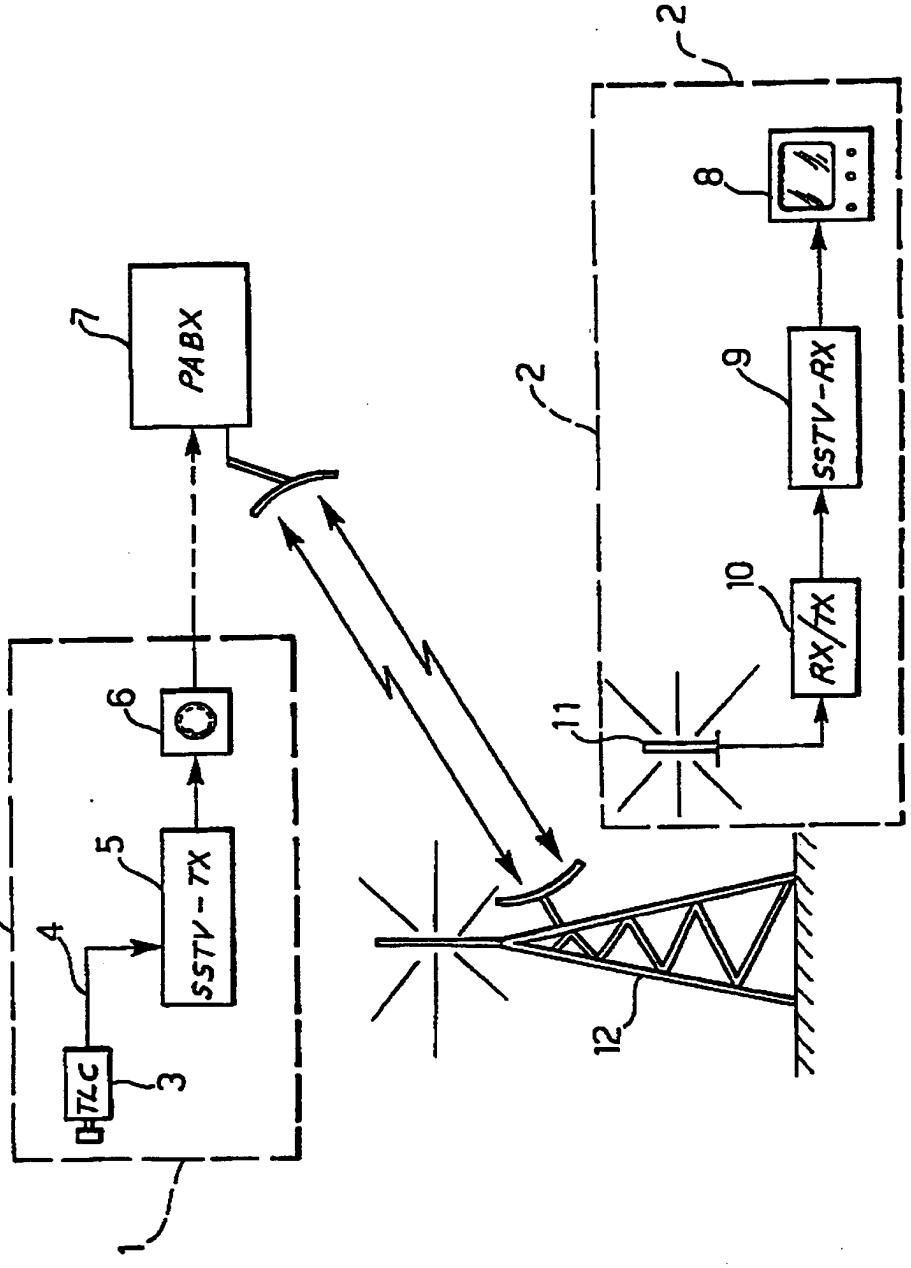


FIG. 1

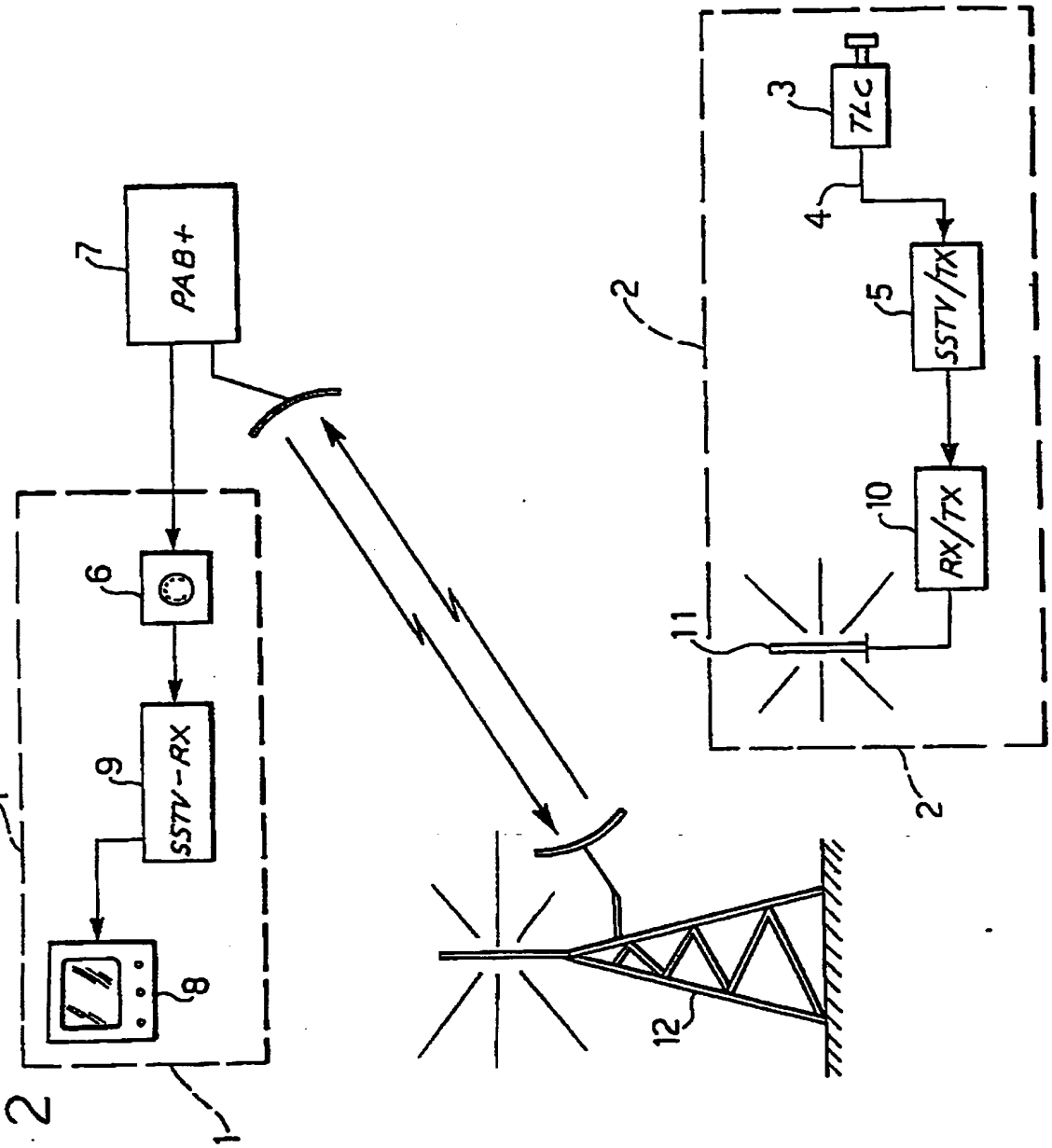


FIG. 2

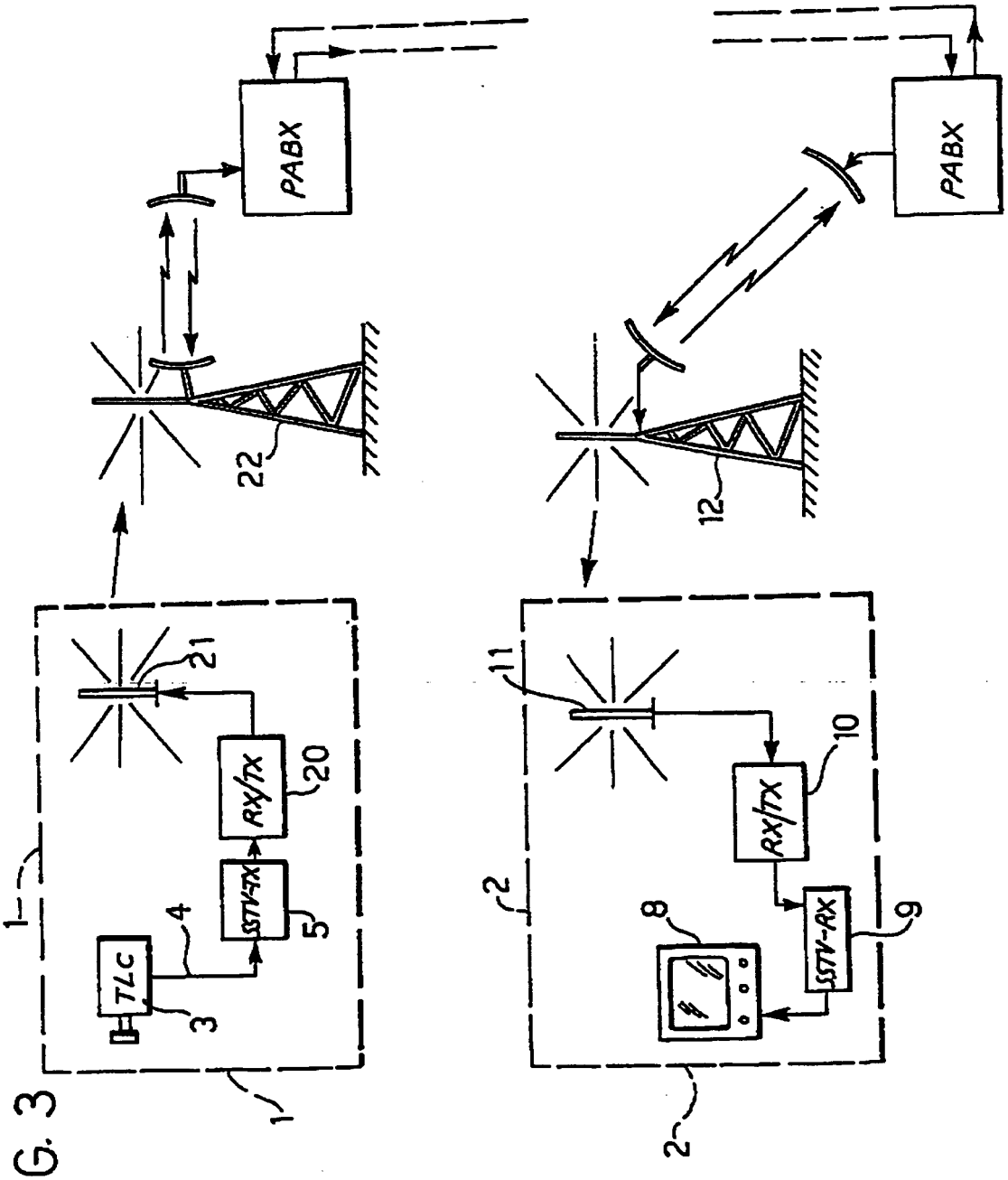
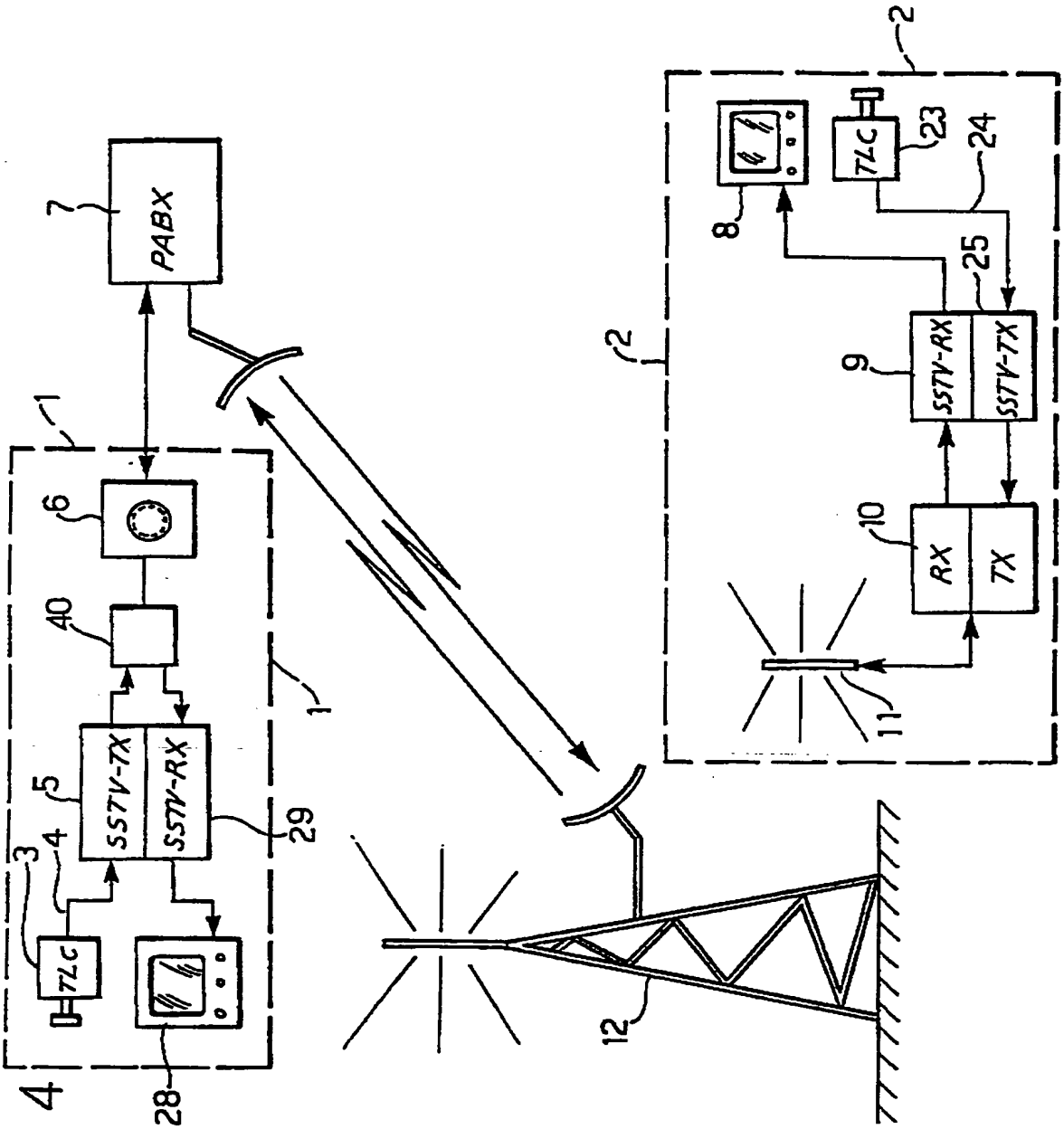

PABX
PABX
22
12
21
11
RX/TX
RX/TX
20
10
SSTV-TX
SSTV-RX
5
9
4
8
TLC
3
1
2
1
2

FIG. 3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1
6
40
5
SSTV-TX
SSTV-RX
4
3
TLC
29
28
2
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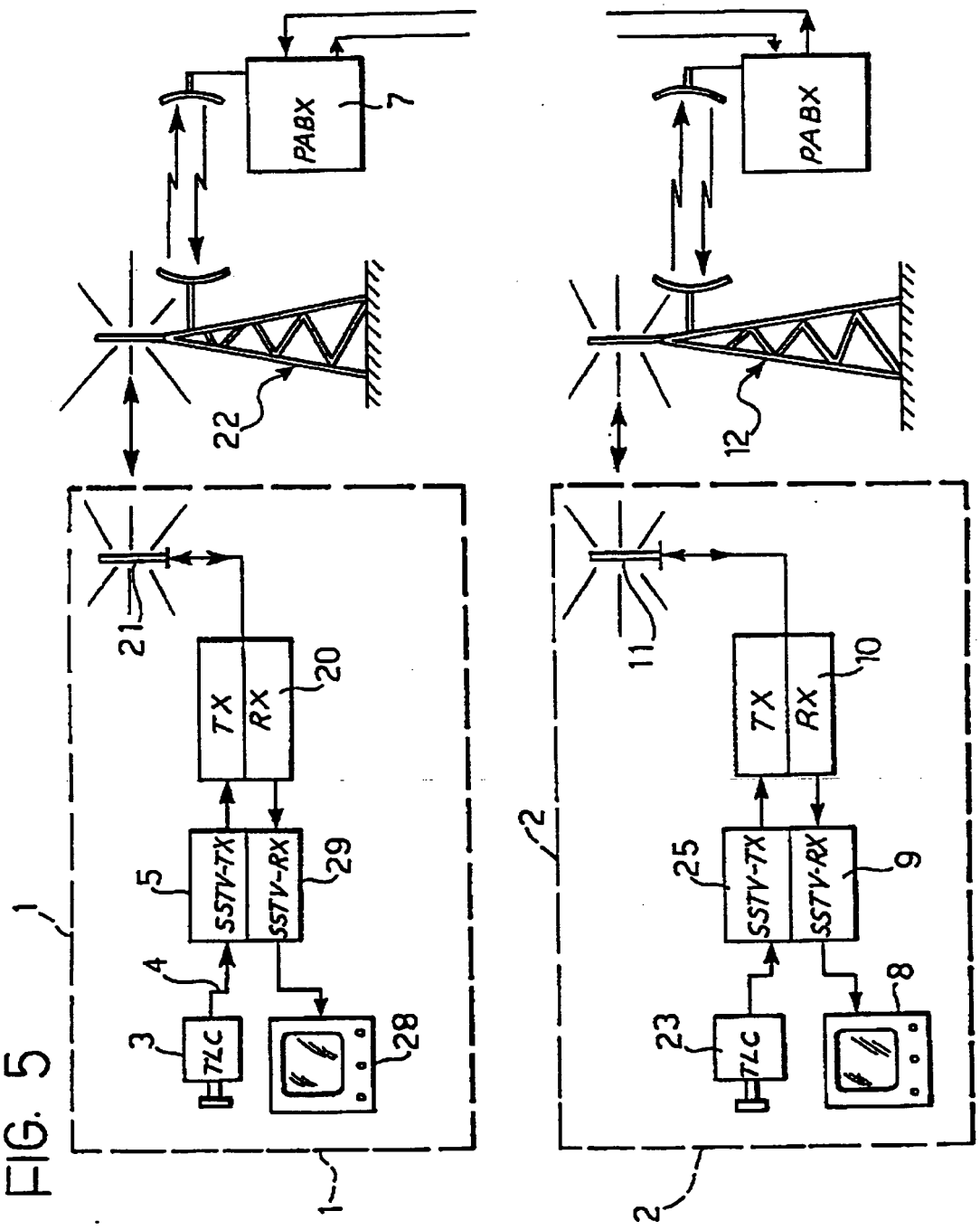
TLC
23
24
25
9
SSTV-RX
SSTV-TX
10
RX
TX
11
12

FIG. 4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TX
RX
20
5
SSTV-TX
SSTV-RX
29
4
3
TLC
28
1
PA BX
12
11
10
25
9
23
8
2

FIG. 5

"A Slow-Scanning Remote Monitoring System Using the Mobile Cellular Radio Communication System"

The invention relates to slow-scanning remote monitoring systems.

More specifically the invention relates to a remote monitoring system including

a first station comprising a filming video camera and a slow-scanning TV transmitter connected to the output of the video camera, and

a second station comprising a slow-scanning TV receiver and a monitor connected to the output of the receiver;

at least one of the stations being mobile;

the stations also comprising respective connecting means for communication via a preexisting telecommunication system including the telephone network and at least one mobile radio type connecting link.

Other features and advantages of the remote monitoring system according to the invention will be clear from the following detailed description, given by way of non-limitative example only and referring to the accompanying drawings, in which Figs. 1 to 5 show five different embodiments of a remote monitoring system according to the invention.

In the embodiment illustrated in Fig. 1, a remote monitoring system according to the invention comprises two stations (general references 1 and 2).

Station 1 comprises a filming TV camera 3. The baseband video signal generated during operation by the TV camera 3 is conveyed along a coaxial cable 4 to the input of a slow-scanning transmitter 5 of a kind known per se. The transmitter scans the filmed image during a time variable e.g. from 5 to 20 seconds and converts the composite video signal into a sound signal in the band between 1000 and 3000 Hz compatible with normal telephone systems.

The output of the slow scanning transmitter 5 is connected to a user's telephone set 6.

In the embodiment in Fig. 1, the telephone set 6 is used substantially only for calling the receiving station 2.

During operation, signals from the telephone set 6 travel along the user's line to the nearest telephone exchange (PABX) 7.

Station 2 is mobile and is installed e.g. on a motor vehicle. It comprises a TV monitor 8 whose input is connected to the output of a slow-scanning TV receiver 9 of a kind known per se. The input of the receiver 9 is connected to the output of a mobile cellular radio terminal 10 of a kind known per se and provided with an antenna 11.

During operation, the call signal from the user's telephone 6 reaches the nearest telephone exchange 7, which routes the call along the microwave radio bridge network of the cellular communication system. The call

signal is broadcast from the radio masts of the network, until the called mobile terminal 10, in reply to the call, makes a duplex-type connection. In this manner, the signal transmitted by the nearest radio mast 12 is received by the antenna 11 of terminal 10. Once the terminal has recognised its own calling code, it enables its associated sound system, thus informing the user of the mobile station 2 that a call has arrived. The release mechanism of the handset of the terminal 10 locks the connection, thus connecting the output of terminal 10 to the input of the slow-scanning receiver 9. When the connection has been made, the slow-scanning transmitter 5 of station 1 supplies the receiver 9 of the mobile station 2 with a start signal followed by image signals compressed in the 1000 - 3000 Hz band. The receiver 9, which normally has its own image memory, stores the incoming information and displays images on the monitor 8, the quality and definition of the images depending directly on the length of time for which they were received. Short reception times will correspond to low definition, and contrariwise longer reception times will correspond to better definition.

The manner of operation described hereinbefore is based on a manual calling system, but can be automated in known manner, e.g. by combining the user's telephone 6 with an alarm detector or a monitoring system and replacing the manual telephone set 6 by an automatic telephone set with a memory. In that case, in the event of an alarm situation, e.g. theft or fire in the place monitored by the fixed station 1, the telephone device therein will automatically call the stored

user's number and, once a connection has been made with the mobile radio terminal 10 of the mobile station, will automatically enable the slow-scanning transmitter 5 to transmit image signals.

The system described hereinbefore with reference to Fig. 1 is for remote monitoring, from a mobile receiving station, of a stationary object to be protected, such as a bank or jeweller's or home.

Fig. 2 shows a variant embodiment of the remote monitoring system according to the invention, in which the fixed station 1 is the receiving station whereas the mobile station 2 is the transmitting station.

In Fig. 2, like parts or elements or those corresponding to parts already described are given the same reference numbers as before.

In the system in Fig. 2, the mobile station 2 comprises a TV camera 3 which, via a coaxial cable 4, supplies a baseband image video signal to the input of a slow-scanning transmitter 5. The transmitter output is connected to the input of a mobile cellular radio terminal 10.

The fixed station 1 comprises a TV monitor 8 whose input is connected to the output of a slow-scanning video receiver 9, the input of which is connected to a user's telephone set 6 connected to the nearest telephone exchange 7 via a user's line.

In the embodiment in Fig. 2, the slow-scanning transmitter 5 in the mobile station 2 scans the filmed image during a time variable from 2 to 40 seconds, and converts the composite video signal into a sound signal in the 1000 - 3000 Hz band compatible with normal telephone systems. The output of transmitter 5 is connected to the monitoring and control panel of terminal 10, which is used for selection and transmission and reception. The output signal from terminal 10 is transmitted via antenna 11 until it reaches the nearest radio mast 12 of the mobile cellular radio telecommunication system. Once a free channel is available, a duplex connection is automatically made between the cellular system and the terminal 10 of the mobile station 2. The call signal, preceded by the selection code of the address district, is sent via the service radio bridge network to the local exchange (PABX) 7 nearest the fixed station 1. The signal, via the local network, reaches the user's telephone 6, which rings to announce the incoming call. A connection is made by lifting the handset of telephone 6, when the transmitter 5 of the mobile station 2 supplies the network with a start signal followed by the image signal compressed in the 1000 - 3000 Hz band.

The receiver 9 in the fixed station 1, comprising its own image memory, stores the incoming information and supplies the monitor 8 with a composite video signal, the quality and definition of which depend on the time during which the image has been received.

In Fig. 2 also, the manner of operation described hereinbefore is based on a manual call system which can be automated by combining the mobile radio terminal 10 with an alarm detector or a monitoring system, and by using the memories in the control panels of the terminal. Accordingly in practice, if a state of alarm occurs, the control panel of terminal 10 automatically calls the stored user's number and automatically enables the receiver 9, once a connection has been made to the user's telephone 6 in the fixed station.

The embodiment described hereinbefore with reference to Fig. 2 is particularly suitable for remote monitoring of moving means and objects, and in all cases in which the transmitter cannot be connected to a normal telephone line (e.g. lorries, armoured vehicles, recording of landslide movements etc).

Fig. 3 shows another embodiment of the system according to the invention, in which the filming and the remote monitoring station are both mobile. The filming station in the system in Fig. 3 has substantially the same layout as the filming station in the system shown in Fig. 2 and comprises a video camera 3, a slow-scanning transmitter 5, a mobile cellular radio terminal 20 and an associated antenna 21.

The receiving station 2 has substantially the same layout as the receiving station in the system in Fig. 1, and accordingly comprises a monitor 8 connected to a slow-scanning receiver 9, the input of which is coupled to a mobile cellular radio terminal 10 provided with an antenna 11.

During operation, the baseband video signal from the TV camera 3 of station 1 reaches the transmitter 5, which scans the image for a variable time and converts the composite video signal into a sound signal in the aforementioned band between 1000 and 3000 Hz. The monitoring and control panel of the mobile radio terminal 20 is used for selection and transmission/reception. The signal from the terminal is radiated into the ether via antenna 21 until it reaches the nearest radio mast 22 of the mobile cellular radio system. As soon as a free channel is detected, the call signal transmitted into the ether is transmitted via the service bridge network of the cellular system to the radio mast 12 nearest the mobile radio terminal 10 of station 2. The two mobile stations are connected by the release mechanism of the handset on the control panel of terminal 10. The transmitter 5 in station 1 then supplies the network with a start signal followed by the image signal compressed into the 1000 - 3000 Hz band.

The slow-scanning receiver 9 in station 2 stores the incoming information, i.e. supplies the monitor 8 with a composite video signal, the quality or definition of which depend on the time during which the image has been received.

The manner of operation of the system described hereinbefore is based on manual calling, but can be automated in this case also.

The system described hereinbefore with reference to Fig. 3 is particularly suitable in situations where it

is necessary to exchange images between mobile stations or stations not connected to the telephone network, more particularly for the purpose of monitoring or security.

The layouts described hereinbefore with reference to Figs. 1 to 3 are unidirectional. We shall now, with reference to Figs. 4 and 5, describe two embodiments of systems for bidirectional communication.

In the embodiment in Fig. 4, station 1 is fixed whereas station 2 is mobile. The fixed station 2 comprises a TV camera 3 connected by a coaxial cable 4 to a slow-scanning transmitter 5. The station also comprises a monitor 28 connected to the output of a slow-scanning receiver 29. The output of transmitter 5 and the input of transmitter 29 in station 1 are connected to a switching device 40, e.g. of the known "fork" kind, connected to a user's telephone set 6. The set is connected to the nearest exchange (PABX) 7 in the telephone network.

The mobile station 2 comprises a video camera 23 connected by a coaxial cable 24 to the input of a slow-scanning transmitter 25. Station 2 also comprises a monitor 8 connected to the output of a slow-scanning receiver 9. The output of transmitter 25 and the input of the slow-scanning receiver 9 in station 2 are connected to the transmission channel and the receiving channel respectively of a mobile cellular radio terminal 10 associated with an antenna 11.

In Fig. 4, reference 12 again denotes the radio mast of the mobile cellular radio system nearest the mobile station 2.

The system in Fig. 4 is for sending image signals from the fixed station 1 to the mobile station 2 and vice versa. In the case of simultaneous transmission, the connection is made by time division, e.g. with transmission periods of 20 seconds in alternate directions, separated by intervals of e.g. 2 seconds for any required exchange of switching commands and for reversing the direction of transmission.

Fig. 5 is a diagram of a likewise bidirectional embodiment for two-way transmission of image signals between two stations 1 and 2, both mobile. Both stations therefore have the same structure, more particularly the structure already described with reference to the mobile station 2 in the system in Fig. 4.

During operation, the transmission channel between the mobile stations 1 and 2 in Fig. 5 is used in one direction, e.g. for 20 seconds (the period during which the image is received) for transmitting a picture from the mobile cellular radio terminal 20 to the mobile cellular radio terminal 10. After an interval of 2 seconds for any required exchange or switching controls and for reversing the direction of transmission, the transmission channel is used for another 20 seconds for sending a picture in the opposite direction, i.e. from the mobile radio terminal 10 to the mobile radio terminal 20.

The system according to the invention is for TV transmission over a distance, with slow scanning, using a mixed transmission channel (radio and telephone network) as an alternative to the normal telephone network. The system, which combines existing slow-scanning TV systems with novel mobile cellular telephone communication systems, is particularly convenient for use in the security sector and for construction of flexible networks.

Of course, without altering the basic features of the invention, the embodiments and constructional details can vary widely from those described and illustrated by way of non-limitative example only, without thereby departing from the scope of the present invention.

C L A I M S

1. A remote monitoring system including

a first station (1) comprising a filming video camera (3) and a slow-scanning TV transmitter (5) connected to the output of the video camera (3), and

a second station (2) comprising a slow-scanning TV receiver (9) and a monitor (8) connected to the output of the receiver (9);

at least one (1) of the stations (1, 2) being mobile;

the stations (1, 2) also comprising respective connecting means (6; 10, 11) for communication via a preexisting telecommunication system (7, 12) including the telephone network (7) and at least one mobile radio type connecting link (12).

2. A system according to claim 1, characterised in that

the first station (1) is fixed and the output of its slow-scanning transmitter (5) is connected to a user's telephone set (6) or the like connected to the telephone network; and

the second station (2) is mobile and the input of its slow-scanning receiving set (9) is connected to a mobile cellular radio terminal (10) provided with an antenna (11) and adapted to receive signals from the

telephone network via the mobile radio communication system.

3. A system according to claim 1, characterised in that the first station (2, Fig. 2) is mobile and the output of its slow-scanning transmitter (5) is connected to a mobile cellular radio terminal (10) provided with an antenna (11) and adapted to transmit signals to the telephone network via a mobile radio communication system, and

the second station (1, Fig. 2) is fixed and the input of its slow-scanning receiving set (9) is connected to a user's telephone set (6) or the like, connected to the telephone network.

4. A system according to claim 1, characterised in that the first station (1, Fig. 3) is mobile and the output of its slow-scanning transmitter (5) is connected to a first mobile cellular radio terminal (20) provided with an antenna (21) and adapted to transmit signals to the telephone network via the mobile radio communication system (12, 22) and

the second station (2, Fig. 3) is also mobile, and the input of its slow-scanning receiver (9) is connected to a second mobile cellular radio terminal (10) provided with an antenna (11) and adapted to receive signals from the telephone network via its mobile radio communication system (12, 22).

5. A system according to claim 1, characterised in that the first station (1, Fig. 4) is fixed and also

comprises a slow-scanning receiver (29) and a monitor (28) connected to the receiver (29); the output of the transmitter (5) and the input of the receiver (29) in the first station (1) can be selectively coupled to a user's telephone set (6) or the like, connected to the telephone network, and

the second station (2, Fig. 4) is mobile and also comprises a video filming camera (23) and a slow-scanning transmitter (25) connected to the output of the video camera (23); the output of the transmitter (25) and the input of the receiver (9) in the second station (2) are connected to the transmission channel and receiving channel respectively of a mobile cellular radio terminal (10) provided with an antenna (11) and adapted to transmit signals to and receive signals from the telephone network via the mobile radio communication system (12).

6. A system according to claim 1, characterised in that the first and the second station (1, 2; Fig. 5) are both mobile and each comprise

a video camera (3, 23) connected to a slow-scanning transmitter (5, 25) and a monitor (8, 28) connected to a slow-scanning receiver (9, 29); in each station the output of the slow-scanning transmitter (5, 25) and the input of the slow-scanning receiver (9, 29) are coupled to the transmission channel and the receiving channel respectively of a mobile cellular radio terminal (10, 20) provided with an antenna (11, 21) and adapted to transmit signals to and receive signals from the

telephone network via the mobile radio communication system.

7. A remote monitoring system substantially as hereinbefore described with reference to and illustrated in the accompanying drawings and for the specified purposes.

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Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
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Relevant Technical fields

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(ii) Int Cl (Edition 5) H04M 1/72 11/00. H04N 7/18. H04Q 7/04

Search Examiner
M K REES

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI, INSPEC

Date of Search
28 AUGUST 1992

Documents considered relevant following a search in respect of claims 1 TO 7

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2222338 A (PLESSEY) see abstract	1, 3
Y	GB 2201563 A (SAYZEN) see abstract; page 1, lines 1-11	1-3
Y	EP 0028933 A2 (ASCOTTS) see whole document	1, 2
Y	EP 0010813 A1 (VIDEOPHONE AUTOMATIC) see whole document	1

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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